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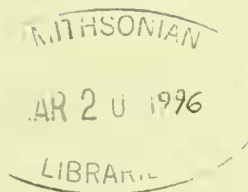
**KEYS TO THE KNOWN AMPHIBIANS AND REPTILES
OF THE
ROYAL CHITWAN NATIONAL PARK, NEPAL**



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INTRODUCTION

The Royal Chitwan National Park (RCNP) is an approximately 930 km² wildlife preserve centered at 27°30'N 84°20'E in the central Terai lowlands of Nepal. It lies between the outer range of the Himalayan Mountains (the Mahabharat Lekh) and the Nepalese-India border. The park consists of the Rapti Valley at elevations of 150-250 m and the Churia and Someswar Hills, collectively known as the Siwaliks, that range to about 650 m elevation. The Siwaliks roughly parallel the political border to the south. Maps of RCNP and descriptions of the ecology of the area have been published in Sunquist (1981), Laurie (1982), and Sunquist and Sunquist (1988).

The following keys to the known amphibians and reptiles of RCNP derive from keys originally included in a report submitted to the Nepalese Department of National Parks and Wildlife Conservation in 1986. The report was designed for use by park visitors and staff but was never published. Zug and Mitchell (1995) subsequently described the herpetofauna, provided an annotated checklist, and summarized natural history information available for the eleven frogs and 44 reptiles known to occur in RCNP. The following keys provide a means of identifying all the amphibians and reptiles of the park, and supplement Zug and Mitchell (1995). They are based on species descriptions in Smith (1931, 1935, 1943), Daniel (1983), Moll (1986a, 1986b), and our observations on specimens available.

FROGS

1. a) Body and hindlimbs short and heavy; skin very rough, covered by numerous warts often tipped with tiny spines, dry in appearance 2
- b) Body and hindlimbs elongate and usually slender; skin smooth or lightly ridged, distinctly moist 3
2. a) Head with distinct bony ridges above eyes and along snout; many body warts capped with black spines Bufo melanostictus
- b) Head without bony ridges; warts less numerous and not strikingly capped with spines Bufo stomaticus
3. a) Tips of fingers and toes expanded into distinct digital pads or disks Polypedates maculatus
- b) Tips of fingers and toes pointed or, at most, slightly expanded 4
4. a) Fingers elongate and sharply pointed without webbing, first and second finger nearly as long as third and fourth; hindfeet fully webbed; back with scattering of small warts; olive brown dorsally with indistinct darker blotches Rana cyanophlyctis
- b) Fingertips blunt, occasionally slightly expanded, 1st and 2nd fingers distinctly shorter than 3rd and 4th; if present dorsally, glandular tissue lies in short or long ridges 5
5. a) Tan back with dark brown sides Rana danieli
- b) Brown or green back with spots, stripes, or marbling 6

6. a) Stout, toad-like in appearance; toes of hindfoot short, inner metatarsal tubercle flattened and longer than first toe Tomopterna breviceps
- b) Slender body; toes of hindfoot long, inner metatarsal tubercle small to moderate in size and rounded 7
7. a) Green with darker green spots on back, a whitish stripe in middle of back and another diagonal white stripe on each side of body; long glandular ridges Rana tigerina group (R. crassa, R. tigerina)
- b) Brown, often with a narrow tan stripe down middle of back, and occasionally with orange or green blotches on nape; numerous short glandular ridges on back Rana limnocharis group (R. limnocharis, R. pierrei, R. shadrensis)

CROCODILES

1. a) Snout broad, length 1.0-1.5 times width; dorsal scales in 16-17 transverse rows; maxillary teeth ≤ 19 .. Crocodylus palustris
- b) Snout narrow and long, length 3.0-5.5 times width; dorsal scales in 21-22 transverse rows; maxillary teeth > 19 Gavialis gangeticus

TURTLES

1. a) Bony shell covered with hard, keratinous epidermal plates (scutes); snout not formed into proboscis; neck and head not longer than shell 3
- b) Shell covered with thick, skin-like layer with no indication of plates; nose elongated into proboscis; neck and head as long or longer than shell 2

2. a) Head appears short with eyes very close to end of snout; snout length (proboscis) less than diameter of eye; neck broadly attached to shell Chitra indica
- b) Head appears long with eyes in normal position, not close to snout; proboscis length \geq eye diameter; greenish head with 3 pairs of oblique black stripes on neck Aspideretes gangeticus
3. a) Shell strongly domed; longitudinal ridges of carapace absent or, if present, number no more than three; terrestrial 4
- b) Shell not strongly domed but slightly flattened; single median longitudinal ridge on shell; aquatic and semiaquatic 6
4. a) Columnar hindlimbs and hindlimbs elephant-like; no distinct ridge on carapace; carapace brown and yellowish; no stripes on head or shell Indotestudo elongata
- b) Hindlimbs not columnar, hindfeet flattened with elongate curved claws; carapacial ridge may be present 5
5. a) Three distinct ridges on carapace; plum-colored carapace usually with three yellowish stripes; reddish stripe on head running through eye usually present; plastron plain yellow Melanochelys tricarinata
- b) Carapace lacks ridges; dark brown to black carapace without stripes; no red stripe on head but yellowish reticulations may be present; plastron dark with a yellowish stripe on each side Melanochelys trijuga
6. a) Anterior margin of fourth vertebral scute in broad contact with posterior margin of third; upper jaw with

medial notch and a cusp on each side; no pattern on
plastron 7

- b) Anterior margin of fourth vertebral narrowly contacts
posterior margin of third; upper jaw without medial notch
or cusps Kachuga tecta

7. a) Second vertebral scute pointed posteriorly and fits into
indentation on the anterior margin of the third vertebral
scute; carapace with three distinct dark stripes
..... Kachuga dhongoka

- b) Second vertebral scute not pointed posteriorly; no
indentation on anterior margin of third vertebral;
carapace without distinct pattern Kachuga kachuga

LIZARDS

1. a) Skin soft and tuberculate, body scales not evident; eyes
without functional eyelids; toes with enlarged pads
..... 2

- b) Skin tough, with granular or large body scales; eyelids
open and close, toes not expanded 5

2. a) Large dorsal tubercles arranged in distinct longitudinal
rows on trunk; whorls of spiny scales on the tail
..... 3

- b) No enlarged dorsal tubercles or a few scattered
tubercles; lower edge of tail with spiny scales 4

3. a) Numerous large dorsal tubercles arranged in 15 or more
longitudinal rows; often with dark spots on back
..... Hemidactylus brookii

- b) Enlarged dorsal tubercles not numerous, arranged in 5-6
rows; no spots on back Hemidactylus frenatus

4. a) Numerous spiny scales forming longitudinal row on lower edge of tail; back often with longitudinal row of light spots; adults to 60 mm snout-vent length ... Hemidactylus garnotii
- b) Widely spaced spiny scales on lower edge of tail; back may have a light stripe along midline; adults greater than 70 mm snout-vent length Hemidactylus flaviviridis
5. a) Granular scales on body and head 6
- b) Plate-like scales on body and head 7
6. a) Short digits, toes of hindfeet slightly longer than sole; nostril nearer to eye than to tip of snout Varanus flavescens
- b) Moderate length digits, toes distinctly longer than sole; nostril nearer to tip of snout than to eye ... Varanus bengalensis
7. a) Scales strongly keeled over entire body; body laterally compressed with long thin tail and limbs; small crest of scales in middle of back Calotes versicolor
- b) Scales smooth or lightly keeled, and shiny; body cylindrical with stout tail and relatively short limbs 8
8. a) Dorsal scales lightly keeled with two or more longitudinal ridges; broad brown stripe on back 9
- b) Dorsal scales smooth Scincella sikimmensis
9. a) Dorsal scales with two keels on each scale; small white

spots on sides of trunk Mabuya dissimilis

- b) Dorsal scales with 5-7 keels on each scale; no white spots, but with narrow black stripes ... Mabuya macularia

SNAKES

1. a) Pair of short, erect slightly recurved fangs on maxillary bone followed by 1-3 small teeth; neck can be expanded into hood 2
- b) All maxillary teeth same size or with pair of long fangs with no other teeth; neck cannot be expanded into hood 3
2. a) Light beige or gray to darker brown or olive in body color; back of hood when expanded usually with 1-2 oval-shaped dark markings; head scales not edged in black; one small tooth usually present behind fang; no transverse dark crossbands on back Naja naja
- b) Dark to light brown body; back of hood not marked with oval markings; brown to olive head with scales edged in black except in large adults; transverse dark crossbars on body but may fade with age; three small teeth behind fang Ophiophagus hannah
3. a) Distinctly large, triangular-shaped, thick head with a deep pit between the eye and nostril on each side; pair of long fangs on enlarged maxillary bone; eye with vertical pupils; head and body greenish except for yellow to white lips; Trimeresurus albolabris
- b) Head not wider than neck or only moderately so; no pit on side of head between eye and nostril; numerous maxillary teeth 4

4. a) Body small and worm-like, encased in smooth, shiny, uniform scales, no enlarged ventral scales; no distinction between head and neck; small, black-pigmented spot (eye) without distinct pupil visible under head scales; tail very short Ramphotyphlops braminus
- b) Body not worm-like, enlarged ventral scales (plates) present; round eyes with distinct pupil present and not covered by head scales 5
5. a) Body distinctly marked with crossbands or with a neck collar that may or may not completely encircle the body 6
- b) Body without crossbands, may have stripes, blotches, or spots, or be uniform in coloration, or have an irregular pattern 16
6. a) Scales strongly keeled, rough in appearance; eyes located high up on sides of head directed upwards; snout broad and rounded; posterior teeth enlarged; six chin shields Homalopsis buccata
- b) Scales smooth or with relatively weak keels; eyes not located near top of head but more lateral in position; snout not broad; fewer than 6 chin shields 7
7. a) Black collar on neck bordered by yellow behind on a brown body; two thin black bars on head; small black spots along midline of back and on head; yellow venter with a small black mark on the outer edge of each scale Sibynophis collaris
- b) Series of crossbars along the body which may completely encircle the body, extend over the midback, or occur irregularly along the body; lacks small black spots along

- the back and head; crossbars present in addition to collar 8
8. a) Series of black and yellow bands which completely encircle the body and tail; body in cross-section appears triangular; head not distinct from neck; vertebral scales enlarged (broader than long posteriorly) Bungarus fasciatus
- b) Black or white crossbars of various widths in series dorsally and laterally, but none completely encircling the body; body round or bread-loafed in cross-section; vertebral scales usually nearly equal in size to adjacent scales 9
9. a) Narrow white crossbars or spots on black to dark gray or grayish-brown body 10
- b) Crossbars black 13
10. a) Head not distinct from neck; round pupils 11
- b) Head distinct from neck; vertical pupils 12
11. a) Irregular white crossbars arranged somewhat in pairs, the crossbars are most conspicuous on the posterior half of body; head dark usually with a white spot in front of eye Bungarus caeruleus
- b) Distinct white crossbars forming a complete series along the back; body black; head white with a black bar between the eyes, a black spot on the top of the snout, and a black bar across the back of the head Ophiophagus hannah
12. a) Snout and head broad and flat; a small brownish or

- grayish-brown snake with a series of white crossbars; a whitish blotch on each side of the back of the head; body scales not elongated, arranged in straight rows Lycodon aulicus
- b) Head blunt and enlarged; two oblique whitish stripes edged in black from top of head to back of jaw; irregular whitish crossbars on body edged in black on anterior edge; body scales elongated and arranged in oblique rows Boiga trigonata
13. a) Body colors red, black, and white; white crossbar or crossband on top of head 14
- b) Body colors not red, black, and white; no white crossbar or crossband on top of head 15
14. a) Head slightly elongated; black bands, where present, are narrow and do not completely encircle the body; top of head mostly black with three crossbars of white; large eyes Chrysopelea ornata
- b) Head blunt, not elongated; red-brown body color with black crossbars (some individuals may have a black stripe along the midback and crossbars restricted to the sides); head black except for a broad white crossband from the anterior edge of the eye to the back of the mouth Calliophis maclellandii
15. a) Distinct black crossbars on a brown body; black triangle on top of snout in front of the eyes; two arrowhead-shaped black bars on head and neck, the tip of the first on the top of the head and the tip of the second at nape; belly white; pupil round; body scales not oblique; no enlarged vertebral scales Oligodon arnensis

- b) Red, gray or brown snake with the body scales edged in black, forming thin crossbars; enlarged jowls producing a triangular-shaped head; large eyes with vertical pupils; body scales form an oblique pattern; enlarged vertebral scales Boiga ochracea
16. a) Distinct stripes present on all or part of upper body 17
- b) No distinct stripes on upper body; may be uniform (without pattern) or with spots or blotches 23
17. a) A single, light or black middorsal stripe on at least the anterior body 18
- b) Two to five distinct black or brownish stripes on body 19
18. a) Single black middorsal stripe down the back; there may be a series of crossbars restricted to the sides; top of head black with a broad white crossband ... Calliophis macclellandii
- b) Single light middorsal stripe on at least the anterior body 20
19. a) Upper body and head dark brown; venter yellowish, with coloration extending onto sides of body for 1.5 scale rows; yellowish to cream upper lip; body slender; pupil round Dendroelaphis tristis
- b) Body olive brown to black; venter whitish; sides of body spotted in yellowish-white; yellow stripe on top of head starting at the snout passing above the eye to the back of the mouth, this outlines a black spearpoint pattern; lips yellow; pupil vertical ... Elachistodon westermanni

20. a) Two stripes on body, either black or light brown 21
- b) Four to five distinct brown or black stripes on body . 22
21. a) Body form in cross-section shaped like a breadloaf, flat on the bottom; stripes black and located on each side of the midline on the posterior half of the body; anterior body with several dark crossbars containing white spots; body color brownish; black eye-jaw stripe present Elaphe helenae
- b) Body form round in cross-section; stripes light-brown to pinkish starting on the anterior part of the body; background color of olive-brown; a series of dark crossbars or spots is located between the two stripes on the anterior body but fade posteriorly; no eye-jaw stripe; lips yellowish; lip color extending upward in front and behind of the eye Amphiesma stolata
22. a) Four to five brown stripes on body and head; stripes may be edged in black; body round in cross-section Psammophis condanarus
- b) Four black stripes on body only; narrow crossband of black across neck; three black streaks beneath the eye; body shaped like a breadloaf in cross-section, flat on bottom Elaphe radiata
23. a) Upper body uniform in color or posterior half of scales edged in black 24
- b) Body with spots or blotches 25
24. a) Upper and lower body green; snout very elongated forming a point; pupil of eye horizontal; yellow line on edge of ventral scales; spaces between scales on body black and

white forming oblique lines, best seen when the body is inflated Ahaetulla nasuta

- b) Upper body brown; snout not elongated; pupil round; uniform pattern or with posterior scales edged in black forming a reticulated pattern, like a braided rope; scales of lips and venter edged in black Ptyas mucosus

25. a) Scales smooth, without keels; heavy bodied with large brownish blotches light in the center and edged in black; body yellowish to grayish; dark streak passing through the eye to the neck; black line below the eye; spear-shaped blotch on top of the head Python molurus

- b) Scales with keels; five rows of black spots on an olive background; one black streak below and one behind the eye; no pattern on top of head Xenochrophis piscator

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